PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Assistant Commissioner for Patents
United States Patent and Trademark
Office
Box PCT
Washington, D.C.20231
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 12 October 2000 (12.10.00)	
International application No. PCT/GB00/00846	Applicant's or agent's file reference A25635/WO
International filing date (day/month/year) 08 March 2000 (08.03.00)	Priority date (day/month/year) 16 March 1999 (16.03.99)
Applicant REECE, Paul, Wyndham	

1. The designated Office is hereby notified of its election made:

   [X] in the demand filed with the International Preliminary Examining Authority on:

   04 September 2000 (04.09.00)

   [ ] in a notice effecting later election filed with the International Bureau on:

2. The election   [X] was

   [ ] was not

   made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer Pascal Piriou
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

Form PCT/IB/331 (July 1992)

GB0000846

PATENT COOPERATION TREATY

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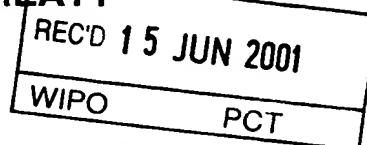
INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference A25635/WO	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)

International application No. PCT/GB00/00846	International filing date *(day/month/year)* 08/03/2000	Priority date *(day/month/year)* 16/03/1999

International Patent Classification (IPC) or national classification and IPC H04L29/06

Applicant BRITISH TELECOMMUNICATIONS PLC et al

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 7 sheets, including this cover sheet.

    ☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

    These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

    I   ☒ Basis of the report
    II   ☐ Priority
    III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
    IV   ☐ Lack of unity of invention
    V   ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement
    VI   ☐ Certain documents cited
    VII ☒ Certain defects in the international application
    VIII ☒ Certain observations on the international application

Date of submission of the demand 04/09/2000	Date of completion of this report 13.06.2001
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Grimaldo, M Telephone No. +49 89 2399 7513

Form PCT/IPEA/409 (cover sheet) (January 1994)

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:
   Description, pages:

   1-9   as originally filed

   Claims, No.:

   1-7   as originally filed

   Drawings, sheets:

   1/7-7/7   as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).

   ☐ the language of publication of the international application (under Rule 48.3(b)).

   ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   ☐ contained in the international application in written form.

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority in written form.

   ☐ furnished subsequently to this Authority in computer readable form.

   ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

   ☐ the description,   pages:

   ☐ the claims,   Nos.:

  ☐ the drawings,   sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

    (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	2-5, 7
	No:	Claims	1,6
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-7
Industrial applicability (IA)	Yes:	Claims	1-7
	No:	Claims	

2. Citations and explanations
    see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

Cited documents

The following documents are mentioned in the Search Report:

> D1: GB-A-2 307 381 (SIEMENS AG) 21 May 1997 (1997-05-21)
> D2: EP-A-0 836 306 (HEWLETT PACKARD CO) 15 April 1998 (1998-04-15)
> D3: US-A-5 732 078 (ARANGO MAURICIO) 24 March 1998 (1998-03-24)

The following document is cited from the examiner's own knowledge (PCT Guidelines-VI-7.24). A copy of the document is annexed to the communication:

> D4: Request for comments 1577, M. Laubach, Hewlett-Packard Laboratories,
> January 1994 (http://www.ietf.org/rfc.html)

V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement

1.   Because claim 1 is **so vaguely and broadly formulated** its disclosure can be read onto each of the documents D1-D4.

1.1   For example, document D1 discloses (page 2, line 21 - page 3, line 21 and figures 1 and 2) a method of operating a communication network comprising the steps of:
  *   establishing a data flow between a customer terminal (data communication terminal PC) and another data terminal (server CNS), the data flow conforming to a best-effort packet-routing protocol (computer network CN, eg. Internet);
  *   subsequently initiating from the customer terminal the use of a switched virtual circuit trough the network (wide-band network BN) for the data flow.

1.2   For example, document D2 discloses the same subject-matter if the customer and data terminals are replaced by the machines M and T, the best-effort packet-routing protocol data flow by the IP/ATM layer 21 and the switched virtual circuit by the ATM network (abstract, column 1, line 55 - column 4, line 34 and figures 1,

3 and 4).

1.3 For example, document D3 discloses the same subject-matter if the customer and data terminals are replaced by the first host 220 and second host 250 , the best-effort packet-routing protocol data flow by the wide are 230 data flow and the switched virtual circuit by the guaranteed bandwidth network 260 (abstract, column 3, line 23 - column 3, line 54 and figure 6).

1.4 Without going into details, it appears furthermore that the subject-matter of claim 1 is not new in respect of the disclosure of document D4, see in particular paragraphs 2 and 3.

1.5 It is therefore considered that the subject-matter of independent claim 1 is already known from documents D1-D4 and the subject-matter of claim 1 lacks novelty in the sense of Article 33(2) PCT.

2. Independent claim 6 although phrased as an apparatus claim (terminal) discloses a subject-matter broader than the subject-matter of claim 1 (no best-effort packet-routing protocol is specified) and as a consequence lacks novelty in the sense of Article 33(2) PCT for the same reasons.

3. Should have been the objection of lack of novelty be disputed due to **minor differences** of interpretation, the subject-matter of claim 1 would still not have involved an inventive step over documents D1-D4 (Article 33(1) and 33(3) of the PCT).
This is of particular relevance should have the Applicant attempted to argue on the basis of the difference between the fact that the user, instead of the network, decides when and if to initiate the use of the switched virtual circuit.

4. Dependent claims 2-5 and 7 do not seem to contain any features which, in combination with the features of any of the claims upon which they are dependent, would lead to a claim involving inventive activity (Article 33(3) of the PCT).

Their subject-matter is indeed either derivable from the above-cited documents or concerns simple embodiments without any inventive merit in themselves.

VII. Certain defects in the international application

1. To meet the requirements of Rule 6.3(b) PCT, the independent claims should have been properly cast in the **two-part form**, with those features which in combination are part of the prior art (see documents D1-D4), being placed in the preamble.

2. To meet the requirements of Rule 5.1(a)(ii) PCT, **documents D1-D4** should have been identified in the description and the relevant background art disclosed therein should have been briefly discussed.

3. Reference signs in parentheses should have been inserted in the claims to increase their intelligibility, Rule 6.2(b) PCT. This applies to both the preamble and characterising portion.

4. The reference to the copending application "communication network... (case reference A25679)" cited on page 3, line 4 should have been replaced by the corresponding publication number and publication date.

5. The opportunity should have also been taken to correct a clerical error in the application:
    claim 1, line 7: "the use of the a switched virtual circuit..." should read "the use of **a** switched virtual circuit...".

VIII. Certain observations on the international application

1. The set of claims as a whole lacks clarity due to the lack of consistency between independent method claim 1 and independent apparatus claim 6 as regard to the definition of the essential features of the invention, rendering it difficult for a third part to determine the matter for which protection is sought (Article 6 PCT).

2. The subject-matter of claim 1 is not clearly defined in the sense of Article 6 PCT for the following reasons:

i) the expression "operating a communication network" is so broad and vague since it does not define the field of the claim;

ii) there is no logical relation between the actions a) and b) a part from being acted by the same subject: the customer terminal;

3. The subject-matter of claim 6 is not clearly defined in the sense of Article 6 PCT since is not clear if the "terminal for use in a method according to any one of the preceding claims" is the "customer terminal" or another terminal.

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INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference A25635/WO	**FOR FURTHER ACTION**	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/GB 00/00846	International filing date *(day/month/year)* 08/03/2000	(Earliest) Priority Date *(day/month/year)* 16/03/1999	

Applicant BRITISH TELECOMMUNICATIONS PLC et al

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of _____2_____ sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

   a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

      [ ] the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

   b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

      [ ] contained in the international application in written form.

      [ ] filed together with the international application in computer readable form.

      [ ] furnished subsequently to this Authority in written form.

      [ ] furnished subsequently to this Authority in computer readble form.

      [ ] the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

      [ ] the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. [ ] **Certain claims were found unsearchable** (See Box I).

3. [ ] **Unity of Invention is lacking** (see Box II).

4. With regard to the **title,**

   [X] the text is approved as submitted by the applicant.

   [ ] the text has been established by this Authority to read as follows:

5. With regard to the **abstract,**

   [X] the text is approved as submitted by the applicant.

   [ ] the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.   1

   [X] as suggested by the applicant.   [ ] None of the figures.

   [ ] because the applicant failed to suggest a figure.

   [ ] because this figure better characterizes the invention.

Form PCT/ISA/210 (first sheet) (July 1998)

INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7   H04L29/06   H04Q11/04   H04L12/46

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7   H04L   H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, INSPEC, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GB 2 307 381 A (SIEMENS AG) 21 May 1997 (1997-05-21) page 2, line 21 -page 3, line 21 claim 1	1,4-7
Y	EP 0 836 306 A (HEWLETT PACKARD CO) 15 April 1998 (1998-04-15) column 3, line 4 -column 4, line 34	1,4-7
A	US 5 732 078 A (ARANGO MAURICIO) 24 March 1998 (1998-03-24) column 3, line 23 -column 3, line 54 column 7, line 17 - line 47 claim 1	1-7

☐ Further documents are listed in the continuation of box C.   ☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
23 August 2000	30/08/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Perez Perez, J

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
GB 2307381	A	21-05-1997	DE	19542780 A	22-05-1997
			FR	2741495 A	23-05-1997
EP 0836306	A	15-04-1998	NONE		
US 5732078	A	24-03-1998	CA	2241451 A	24-07-1997
			EP	0872059 A	21-10-1998
			JP	11502997 T	09-03-1999
			WO	9726725 A	24-07-1997

(51) International Patent Classification 7 : H04L 29/06, H04Q 11/04, H04L 12/46	A1	(11) International Publication Number: **WO 00/56031**
		(43) International Publication Date: 21 September 2000 (21.09.00)

(21) International Application Number: PCT/GB00/00846

(22) International Filing Date: 8 March 2000 (08.03.00)

(30) Priority Data:
9906045.1   16 March 1999 (16.03.99)   GB
99305277.8   2 July 1999 (02.07.99)   EP

(71) Applicant *(for all designated States except US)*: BRITISH TELECOMMUNICATIONS PUBLIC LIMITED COMPANY [GB/GB]; 81 Newgate Street, London EC1A 7AJ (GB).

(72) Inventor; and
(75) Inventor/Applicant *(for US only)*: REECE, Paul, Wyndham [GB/GB]; Debens, Schoool Road, Waldringfield, Woodbridge, Suffolk IP12 4QR (GB).

(74) Agent: WELLS, David; BT Group Legal Services, Intellectual Property Dept., 8th Floor, Holborn Centre, 120 Holborn, London EC1N 2TE (GB).

(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: COMMUNICATIONS NETWORK
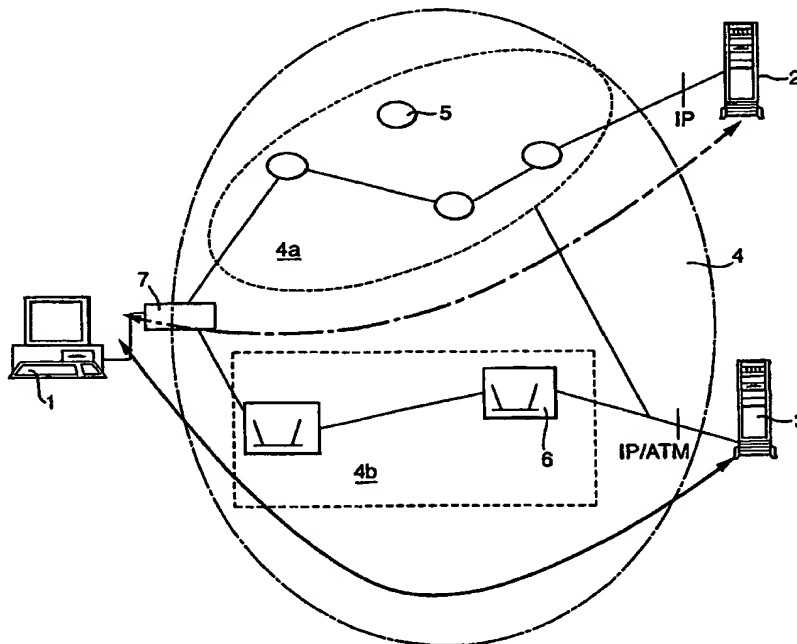
(57) Abstract

In a communications network which handles packet data, a switched virtual circuit is initiated by a customer terminal and is used as a cut–through for packet traffic to or from the customer terminal.

COMMUNICATIONS NETWORK

The present invention relates to a communications network, and in particular to a network using a packet-based protocol such as Internet Protocol

5   (IP).

Conventionally, networks using packet-based protocols such as Internet Protocol (IP) have functioned using so-called "best effort" routing. When and whether a particular router passes on a packet depends on factors such as the length of the queues in buffers in the router. As a result, quality of

10   service, as measured by such parameters as packet loss and latency, has varied considerably depending on the loading of network resources such as routers. While such variation is acceptable for some applications, such as Email, it is potentially a barrier to the use of Internet Protocol for more critical applications such as voice telephony or multimedia conferencing. Accordingly,

15   considerable effort has been directed to providing improved Quality of Service (QoS). One approach has been to supplement IP with QoS-related protocols such as ReSource reserVation Protocol (RSVP). Another approach has been to make use of circuit-switched networks, and particularly ATM networks to carry IP traffic. When a customer terminal and a data source are both

20   connected to an ATM network, then a Switched Virtual Circuit (SVC) may be used to "cut-through" from the terminal to the source, bypassing any intermediate routers, and providing a uniform and predictable QoS level. Standards for networks supporting such a capability have been proposed by the ATM (Asynchronous Transfer Mode) Forum and by the IETF (Internet

25   Engineering Task Force). These standards are known as the the Multi-Protocol over ATM (MPOA) and Multi-Protocol Label Switching (MPLS) standards. When these standards are implemented, a device in the network, such as an MPOA server, detects a data flow that is a candidate for an SVC cut-through, establishes the required SVC circuit, and initiates the diversion of the data

30   through the cut-through.

According to a first aspect of the present invention, there is provided a method of operating a communications network, comprising:

a) establishing a data flow between a customer terminal and another data terminal, the data flowing conforming to a best-effort packet-routing protocol;

b) subsequently initiating from the customer terminal the use of the a -switched virtual circuit through the network for the data flow.

The present invention provides a method of using virtual circuits to give enhanced quality of service that differs significantly from previously proposed techniques. Whereas previously the use of virtual circuits has been regarded as purely an internal function within the network and has been hidden from the user, the present invention transfers control of the virtual circuit capability out of the network to the customer terminal. The user initially communicates with another data terminal, such as a server hosting a web site, using a best-effort protocol such as Internet Protocol. Only when and if the user subsequently elects to initiate the use of a switched virtual circuit does the network change the routing method for data flowing to or from the customer terminal.

Preferably the method includes a step, prior to step (b), of communicating to the customer terminal data indicating potential availability of a switched virtual circuit in the network for the said data flow.

This preferred feature of the invention facilitates the use of hybrid networks where only some data terminals may be connected to, e.g., ATM switches that support switched virtual circuits, while other data terminals may be connected only to, e.g., IP routers. Data is communicated to the customer to indicate when the use of a switched virtual circuit is possible. This data may be provided by a domain name server located in the network, or may be provided by the data server itself, for example in an HTML page indicating an ATM address and a bandwidth capability for the data server. In a preferred implementation, the data is in the form of a URL (Uniform Resource Locator) that is specific to resources accessible via a circuit connected network, and the URL contains all the information necessary to set up the switched virtual circuit. The URL may be in the form:

<circuit-connected identifier part>://<service parameter part> * <address part>

where * is a predetermined separator character. The use of URL's in this manner

is described   and claimed in our copending application, also entitled

"Communications Network", filed 9 December 1998, (Case Reference A25679).

5   The invention also encompasses customer terminals and networks adapted

for use in the invention.

Systems embodying the present invention will now be described in further

detail, by way of example only, with reference to the accompanying drawings, in

which:

10   Figure 1 is a diagram showing a first example of a network embodying the

invention;

Figures 2 to 5 show different phases in the process of establishing a

switched virtual circuit (SVC);

Figure 6 is a flow diagram;

15   Figure 7 is a state machine for a web browser used in implementing the

invention.

As shown in Figure 1, a customer terminal 1, in this example a personal

computer, is connected to other data terminals 2,3 via a network 4.   In this

example, the data terminals 3,4 are web servers arranged to return HTTP

20 (hypertext transport protocol) pages to the customer terminal 1.   The network 4

includes a first subdomain 4a that is part of the public Internet and includes a

number of Internet Protocol (IP) routers 5.   Suitable routers are commercially

available devices such as CISCO series 7500 routers.   A second subdomain 4b

comprises a number of ATM (asynchronous transfer mode) switches 6.   Although,

25 for ease of illustration, only two ATM switches are shown, in practice the

subdomain 4b is likely to contain a larger number of switches.   Suitable switches

are commercially available devices such as ALCATEL 1100 HSS Series 700

switches.   These switches support ATM Switched Virtual Circuits (SVCs), in

accordance with the ATM Forum V3.1 and V4.0 SVC definitions.

30   In this example, the customer terminal includes an ATM card and is

connected via an ATM access router 7 to both of the network subdomains.

One of the data terminals 3,4 has only an IP interface and is connected to

both of the subdomains 4a,4b. The other of the data terminals 3,4 has an IP over

ATM interface and is connected via that interface to both of the subdomains.

In use, the customer terminal 1 initially retrieves web pages from the data terminals 3,4 via the IP network 4a of the first subdomain. The web pages are displayed by a web browser application running on the customer terminal in a conventional fashion. The data flow between the customer terminal 1 and the
5   data terminals 3,4 via the IP network is shown by the dashed broad line in the Figure. The data flow is effected by best-effort routing by the IP routers 5, and accordingly the quality of service varies depending on the loading of the routers.

As already indicated, one of the data terminals 3,4 is also accessible via the ATM network of the second subdomain. When the user wishes to retrieve
10 data, such as a video data, that requires a high and guaranteed quality of service, from the said data terminal, then the user initiates a switched virtual circuit (SVC) via the subdomain 4b to the data terminal. The subsequent data flow via this SVC is indicated by the solid broad line in Figure 1.

The operation of the network will now be described in further detail with
15 reference to Figures 2 to 5. In these Figures, the customer terminal 1 is referenced "End User 1", data terminal 3 is referenced "Content Provider 1" and data terminal 4 is referenced "Content Provider 2". Other customer terminals, referenced "End User 2" and "End User 3" are also shown. Also, in these examples, the connection from End User 1 to the IP subdomain 4a is via an
20 Internet Service Provider (ISP).

End user 1 is connected to the ISP via the ATM network 4b. The connection to the ISP gives End User 1 access to the Internet and to other data terminals having Internet connections. Some only of these other data terminals are also connected to the ATM network 4b. In Figure 2, Content Provider 2 and End
25 User 3 are connected to the ATM network 4b and can potentially be reached via an SVC cut-through, whereas Content Provider 1 and End User 2 have only have connections to the Internet End User 1 need to know which customers can be reached via an SVC cut-through. Examples of mechanisms by which the customer can know if it is possible to establish an SVC cut-through are :

30 A)   If a DNS (domain name server) translation of the chosen customer's URL to an ATM address exists. For example, End User 1 could request a DNS translation for Content Provider 2, by communicating a URL "http://www.CP2.co.uk/" to the DNS. As Content Provider 2 has direct access to an ATM network, the Content Provider 2 URL would map to an

ATM address. Both the IP address of Content Provider 2 and also the corresponding ATM address are returned to the End User 1. The fact that an ATM address has been returned indicates to End User 1 that an SVC cut-through is possible. Similarly, End User 1 may request a DNS translation

5   for Content Provider 1. As Content Provider 1 does not have direct ATM network access the Content Provider 1 URL would not map to an ATM address, and this indicates to End User 1 that no SVC is possible in this case

B)   The originating customer identifies that an SVC cut-through is possible via

10   information which could be downloaded in the form of HTML, that is as a web page displayed by the web browser application. This information would need to include the ATM address, and may also include Bandwidth availability, QoS information and an indication of cost.

C)   A content provider may have an ATM specific URL in the format "atm://

15   ATM parameters @Server ATM address.sub-address/full-path-of-file." This mechanism may be combined with (B), that is, the ATM specific URL may be displayed on an HTTP page, either on the server to which the ATM specific URL relates, for example Content Provider 2, or on another server that such as Content Provider 1, that is not itself on the ATM network but

20   includes links to resources that are on the ATM network.

When the customer chooses to initiate an SVC cut-through, for example in order to access VoD (Video-on-Demand) material on Content Provider 2, signalling is used between the customers across the ATM network to set-up the SVC. This

25   phase is illustrated in Figure 3. Standard ATM-F and ITU-T signalling protocols are used in setting up the SVC. As shown, in the Figure, the connection from End User 1 to the ISP remains active, so that, once the SVC is released, there still exists a connection into the IP network subdomain 4a.

Figure 4 shows the SVC established in the ATM network. Once this is

30   established, the End User 1 can view the selected application or data on Content Provider 2. When End User 1 has finished viewing material that requires an SVC, then the cut-through is released using signalling between the customers across the ATM network, again using standard ATM-F and ITU-T signalling protocols. This release phase is shown in Figure 5.

In a preferred implementation of the invention, mechanism (C), that is the use of ATM-specific URL's, is adopted. In this case, the web browser application running on the customer terminal is adapted to support Winsock (Windows Sockets) version 2 functionality (Windows is a trademark of Microsoft

5   Corporation). Figure 6 is a flow diagram illustrating in further detail the behaviour of a system operating using ATM URL's, and Figure 7 is a state machine diagram for the web browser. The steps shown are as follows:

1. The user searches web pages for the relevant information, as if using a standard web browser. No ATM SVC has been established.

10   2. When the user clicks on the desired ATM Hyperlink/URL, or uses a bookmark, the web browser performs the following operations:-

3. First the Web browser has to determine that this is an ATM URL request, if so, it has to parse/decode the ATM information. This information is stored and used to help construct the profile of the signalling message capability, and

15   determines the socket and protocol state machine type. It should be noted that the ATM URL does not contain all the ATM IE's (Information Elements) defined in the signalling protocols. This is for two reasons. Firstly, not all the defined IE's are sent in the ATM signalling SETUP or LEAF SETUP REQUEST messages. Secondly, the ATM information within the URL contains only the

20   information required by the web browser. The web browser or the WinSock2 API is free to add valid additional ATM information before initiating the ATM SVC. An example of this additional ATM information could be the Calling Party Number, Calling Party Sub-address, Transit Network Selector (TNS) Broadband Sending Complete, Broadband Repeat Indicator, Broadband High and Low Layer

25   Information, Narrowband High and Low Layer Compatibility etc. Before data can be sent between the two entities, the web browser has to use the correct protocol state machine implementation for the URL scheme. The ATM protocol state machine has to be also associated with the ATM socket descriptor. As the URL scheme is 'atm://' the web browser knows it should use the ATM

30   protocol state machine and create ATM sockets. The state machine is used by the web browser to define its behaviour when sending and receiving data over a connection. This state machine has been developed for use with ATM connections. The ATM state machine is described in further detail below with reference to Figure 7.

4. If the web browser client determines after decoding the ATM URL that no ATM parameter value(s) need to be specified manually by the Web browser, then the ATM GUI is not launched and the Web browser uses the underlying WinSock2 Application Programming Interface (API) functionality to establish an ATM SVC

5   to the desired destination. The characteristics of this ATM SVC will be the same as those values returned from the HTTP server in the ATM URL. This corresponds to state ATM_GET_SETTINGS in Figure 4.

5. If the user is required to define a particular ATM parameter value(s), the web browser launches an ATM GUI (Graphic User Interface). This ATM GUI is an

10   extension to traditional web browser applications, in that it allows the end users to enter values for the ATM parameters coded as 'User Defined' within the ATM URL. The values entered by the end user via the ATM GUI are also stored to help build the profile or characteristics of the signalling messages, which will be sent to the ATM server(s). This corresponds to state ATM_GET

15   SETTINGS in Figure 4.

6. WinSock2 is responsible for creating ATM sockets for communication between the web browser and ATM server.. This involves the web browser and ATM server invoking a number of WinSock2 function calls. When the ATM sockets have been created but not connected together, then this corresponds

20   to state ATM_BEGIN_CONNECT, as shown in Figure 7.

7. Once the server and client ATM sockets are created, WinSock2 communicates with the underlying signalling protocol stack to establish an ATM SVC and logically connects the two ATM sockets together. The WinSock2 SPI is responsible for taking the ATM URL parameters, together with any information

25   added by the user, and coding them into the correct format to be used with the underlying signalling protocol, which may be, e.g., UNIv3.0, UNIv3.1, UNIv4.0, UNIv4.1 or Q.2931. The WinSock2 SPI is also responsible for including mandatory Signalling IE's, not defined in the ATM URL. Examples of these mandatory IE's include, the Protocol Discriminator, Call Reference, Message

30   Length, Message Type and Endpoint Reference (for Point-to-Multipoint connections) plus LIJ Sequence Number (for LIJ connections). If the ATM SVC is successfully established then, charging records for that connection can be generated and state ATM SEND_REQUEST is entered, see Figure 7. If however,

the SVC fails to be established, the web browser launches a window to inform the user of the event and enters the ATM_ERROR_FOUND state.

8. Once the ATM SVC is established, data can be sent and received between the web browser and the ATM server. Before the file(s) are downloaded the ATM server returns the total length of the file to be downloaded to the web browser. The number of bytes of data received by the web browser is incremented and compared with the file size obtained at the GET_FILE_SIZE state, of Figure 7. If the two values are equal, then the whole file has been transferred and the ATM_TRANSFER_STOP state is entered, else the transfer continues. When downloading data, control is passed back from the state machine to the calling application, so it won't block user commands. Knowing the size of the file, allows the web browser to display the transfer progress status (indicating the proportion of bytes received compared to the total number yet to be received) and to estimate the remaining time of the transfer. As many different types of data can be downloaded, the web browser has to know how to interpret each type of data. Depending on the associated Multipurpose Internet Mail Extensions (MIME) type, the data is directed to either a plug-in application, a file name on a local or remote disc, or to the web browser display.

9. If errors occur during the download process, the state machine enters the ATM_ERROR_DONE state. This may occur for several reasons, for example when the ATM server did not send the size of the file in the first packet; or when the transfer of a buffer cannot be completed because either there was a network or application failure etc.

10. If the user wishes to terminate the file download, they can, by pressing the 'CANCEL' button on the progress dialogue box or alternatively by pressing the 'STOP' button on the web browser GUI. This causes the state, ATM_ERROR to be entered, as shown in Figure 7 and causes the ATM SVC to be released. In addition, providing there is end-to-end support between the web browser and the ATM server to support ITU-T Rec. Q.2963.1, or Q.2963.2 and (Q.2725.2 or Q2725.3) signalling, then the end user can modify the traffic characteristics of the ATM SVC. This modification process can be achieved via the use of the ATM GUI and the user entering new information or automatically by the application, which could be transparent to the user.

11. Once the file(s) have been downloaded to the web browser, the ATM server automatically starts the first step to close the ATM sockets. By closing the sockets causes the ATM server in turn, to release the ATM SVC between itself and the web browser. Any charging mechanisms associated with the SVC

5   should be stopped. The web browser is now in the ATM_TRANSFER_STOP state, as shown in Figure 7.

12. Once the ATM SVC has been released, the server and client can then completely shut down their ATM sockets associated with the SVC and release any resource(s) allocated to them. The web browser is now in the

10   FREE_ATM_RESOURCES state as shown in Figure 7 and control is passed back to the calling process within the web browser.

CLAIMS

1. A method of operating a communications network, comprising:

    a) establishing a data flow between a customer terminal and another data terminal, the data flow conforming to a best-effort packet-routing protocol;

    b) subsequently initiating from the customer terminal the use of the a switched virtual circuit through the network for the data flow.

2. A method according to claim 1 including a step, prior to step (b), of communicating to the customer terminal data indicating the availability of a switched virtual circuit in the network for the said data flow.

3. A method according to claim 2, in which the said data indicating the availability of a switched virtual circuit comprises a URL having a format specific to resources located on a circuit-connected network.

4. A method according to any one of the preceding claims, in which the packet-routing protocol is Internet Protocol.

5. A method according to any one of the preceding claims, in which the switched virtual circuit is established in an ATM (asynchronous transfer mode) network.

6. A terminal for use in a method according to any one of the preceding claims, the terminal including a packet data interface for connection to a communications network, and means for initiating a switched virtual circuit in the communications network , which switched virtual circuit, in use, provides a circuit-connected path for packet data communicated via the said packet data interface.

7. A communications network including one or more terminals according to claim 6.
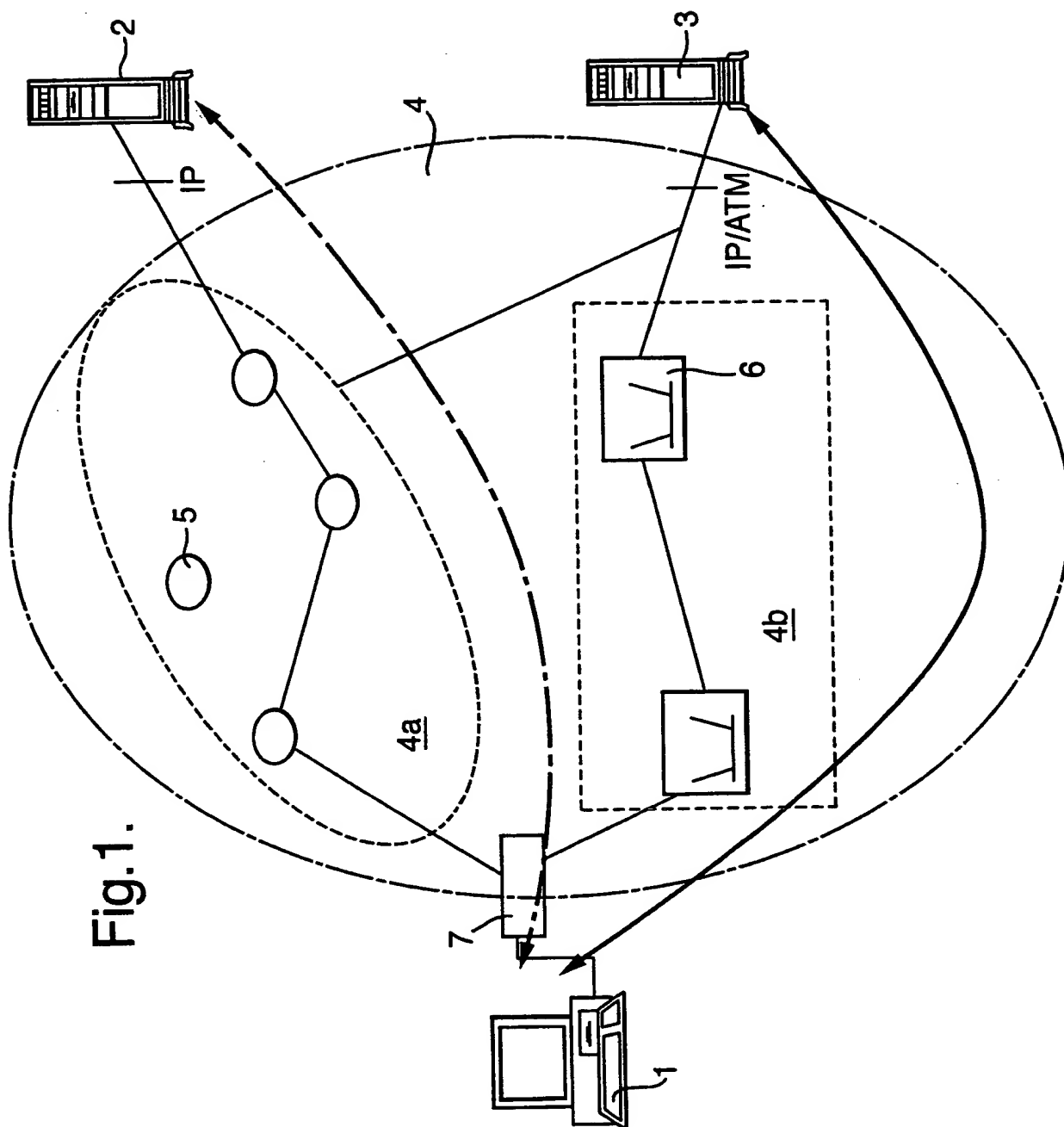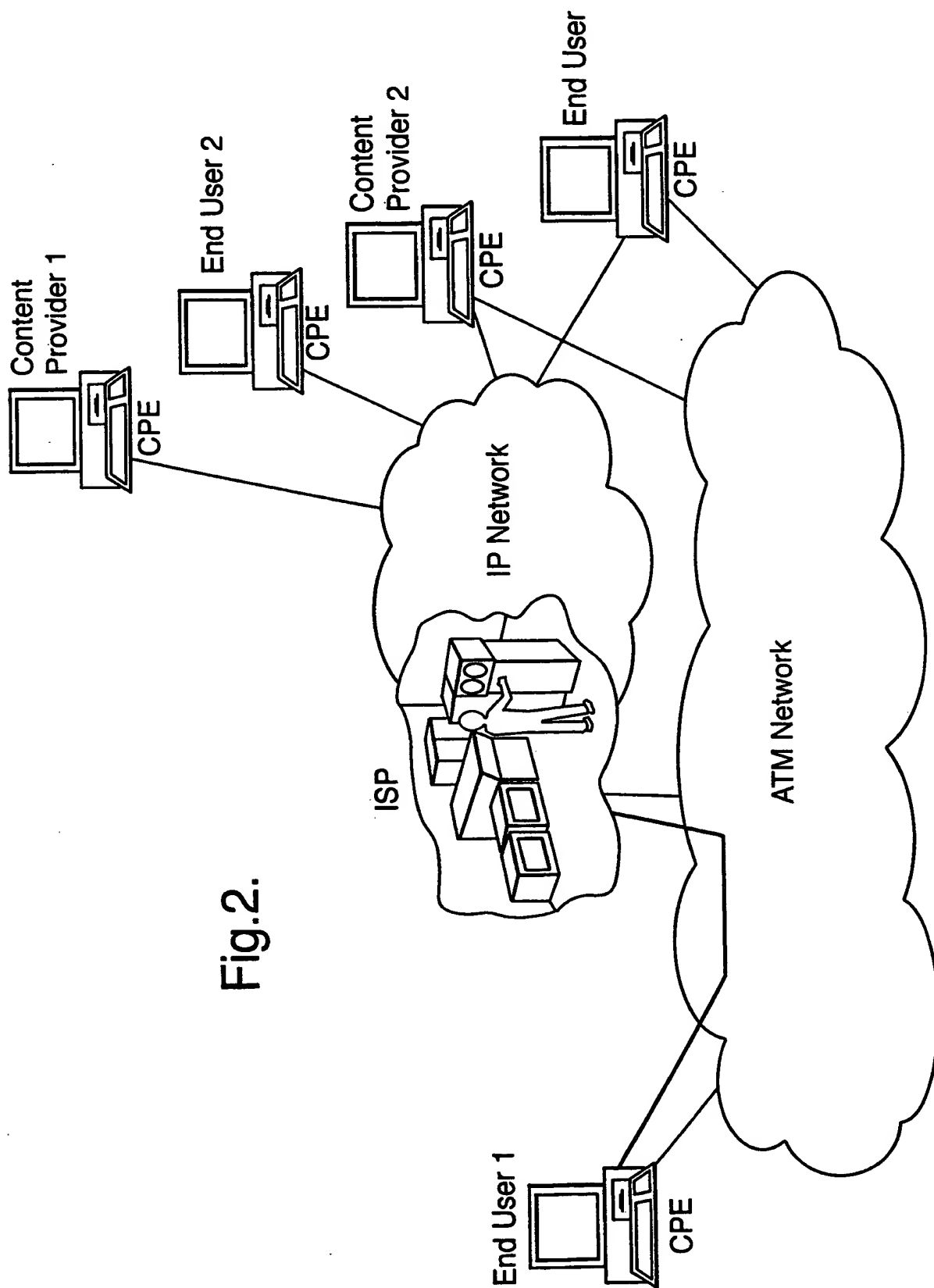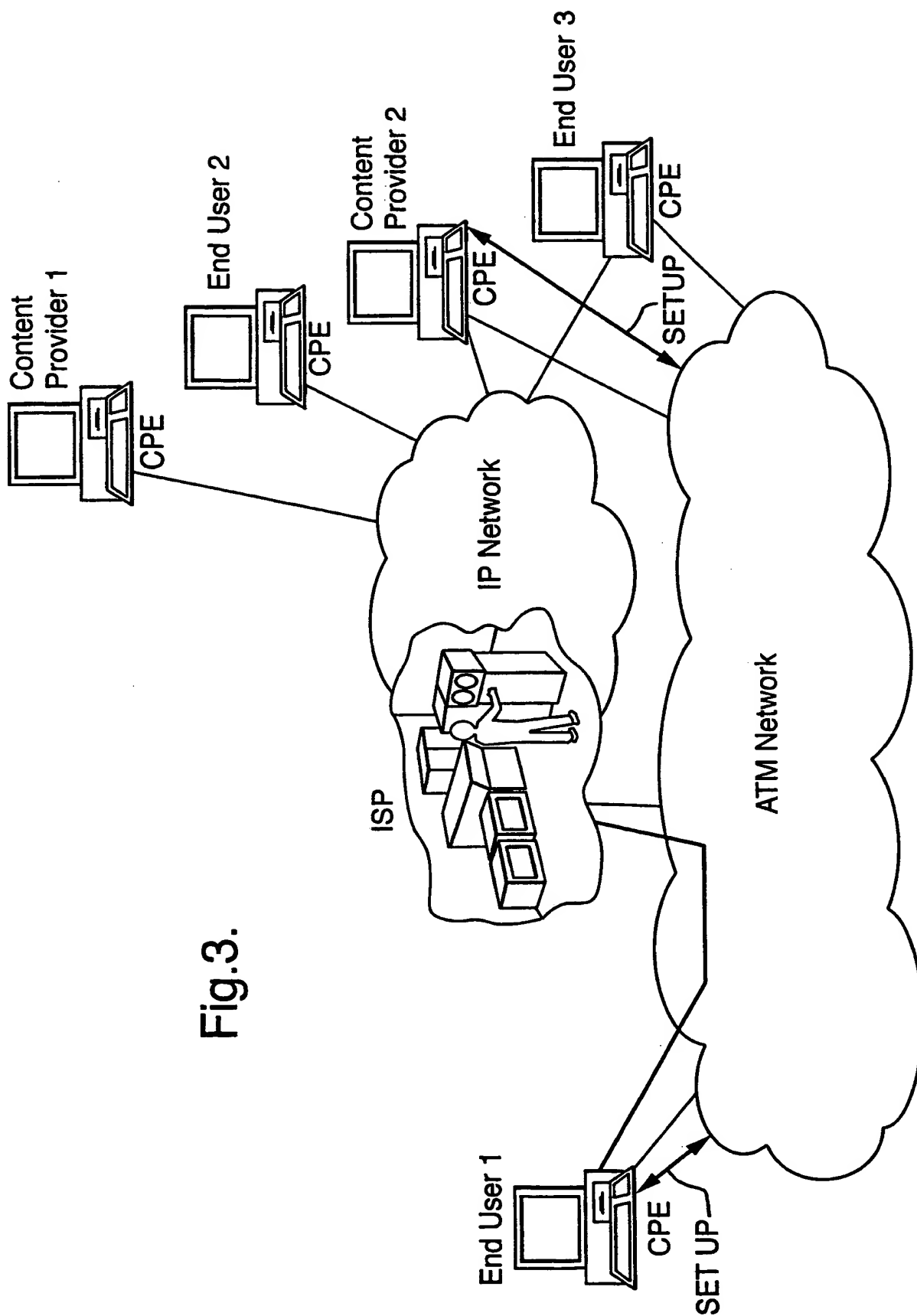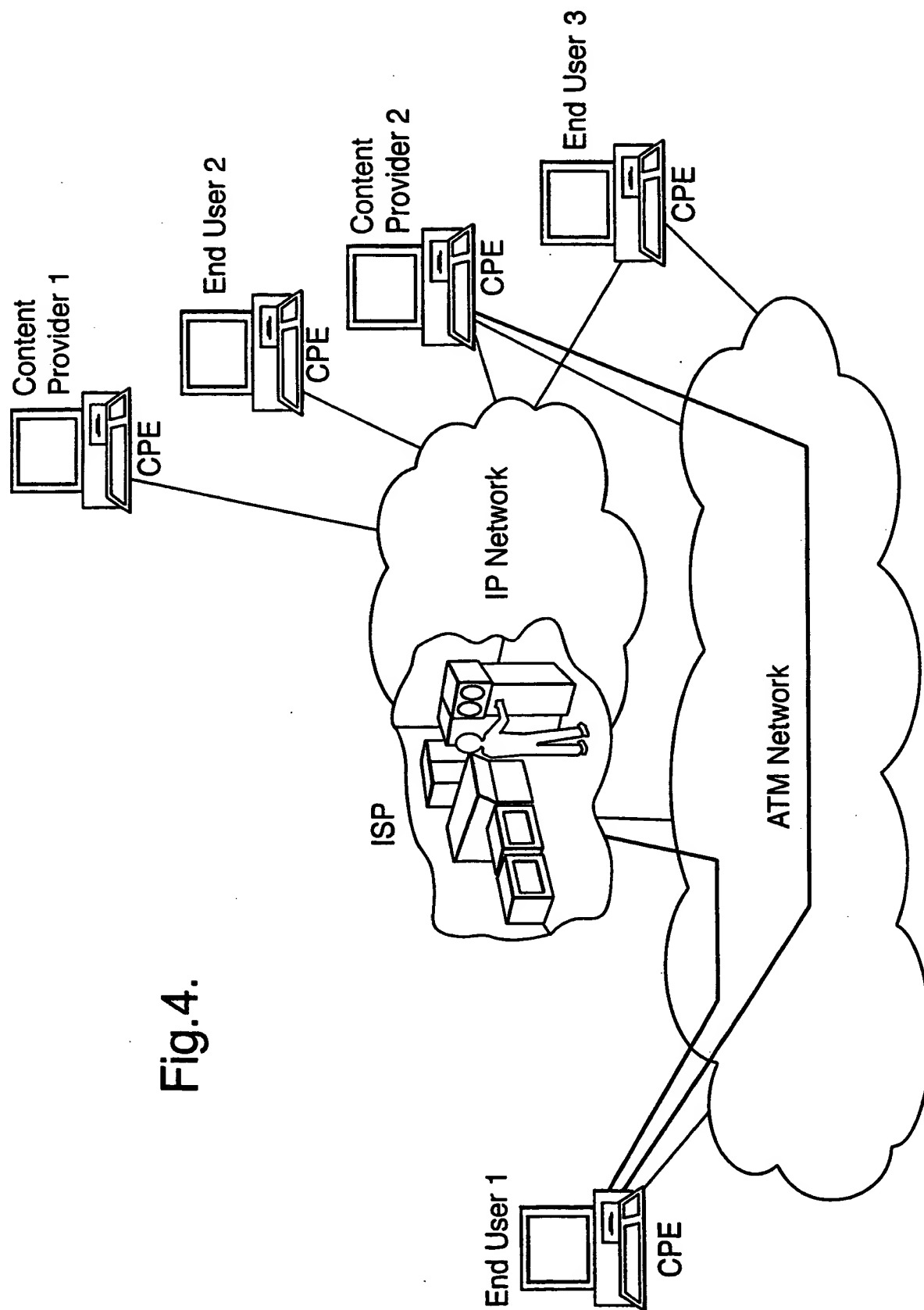
Fig.1.

Fig.2.

Fig.3.

Fig.4.

Fig.5.

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Fig.6.

Browse Web Sites/Pages — 1

Select an ATM based Hyperlink — 2

Web Browser parsers ATM URL — 3

ATM GUI launched? — 4

YES → User Enter Values — 5

NO → WinSock2 ATM sockets created — 6

ATMSVC est. using signalling — 7

Start to Download File — 8

File Download Complete — 9

Relased by User — 9

Release ATMSVC — 10

Release ATM Sockets — 11

Launch Plugin/Save to Disc — 12

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Fig.7.
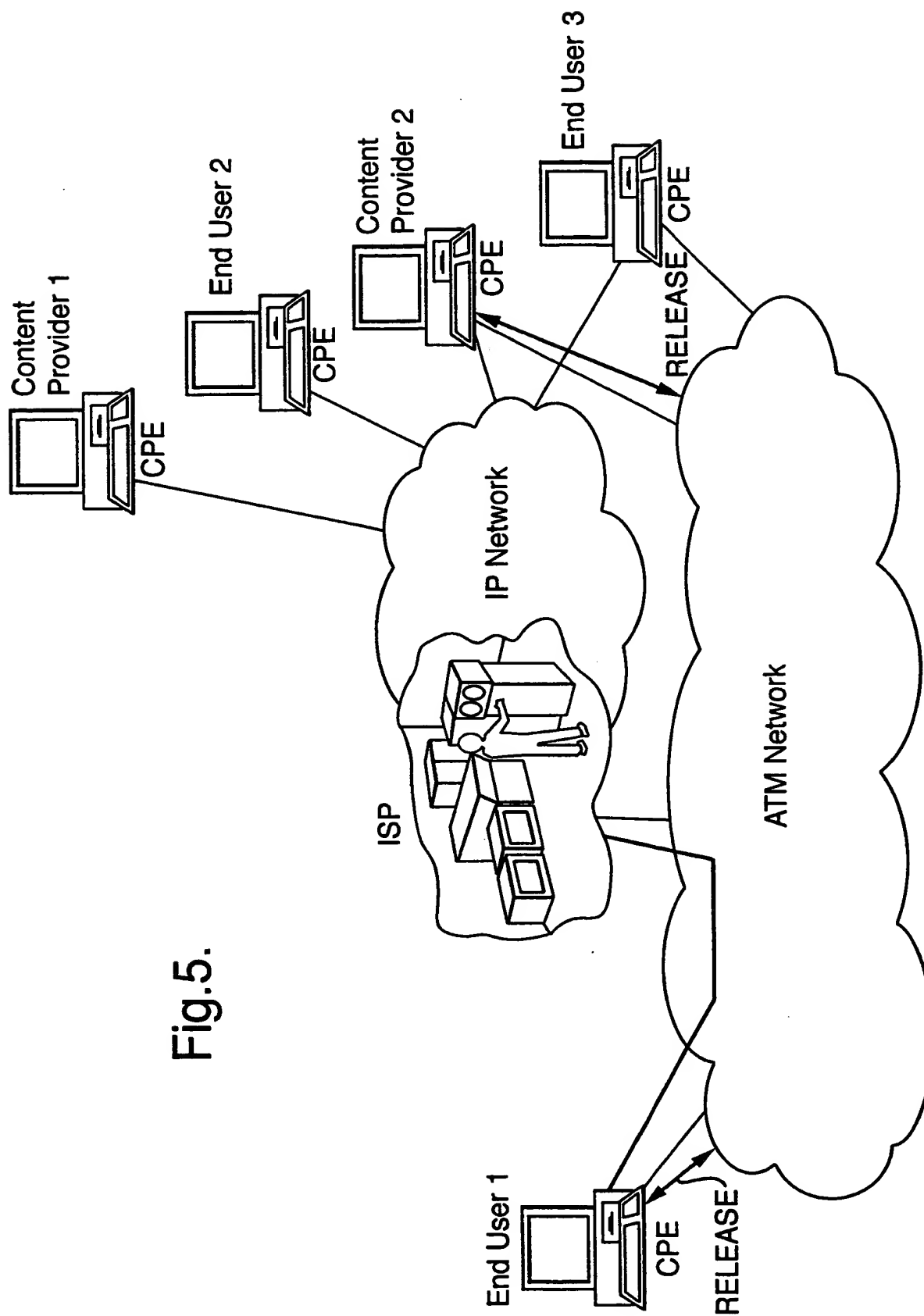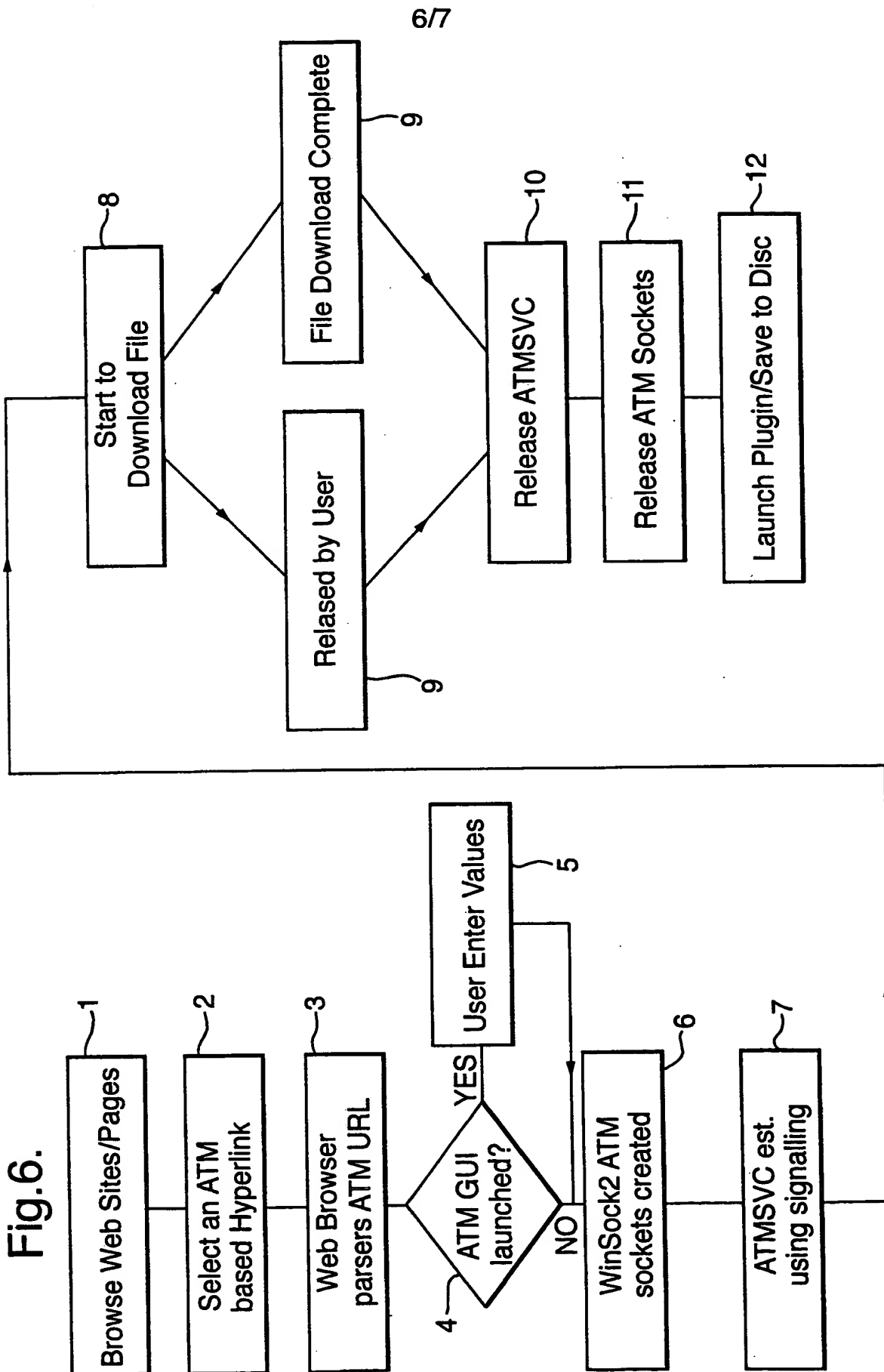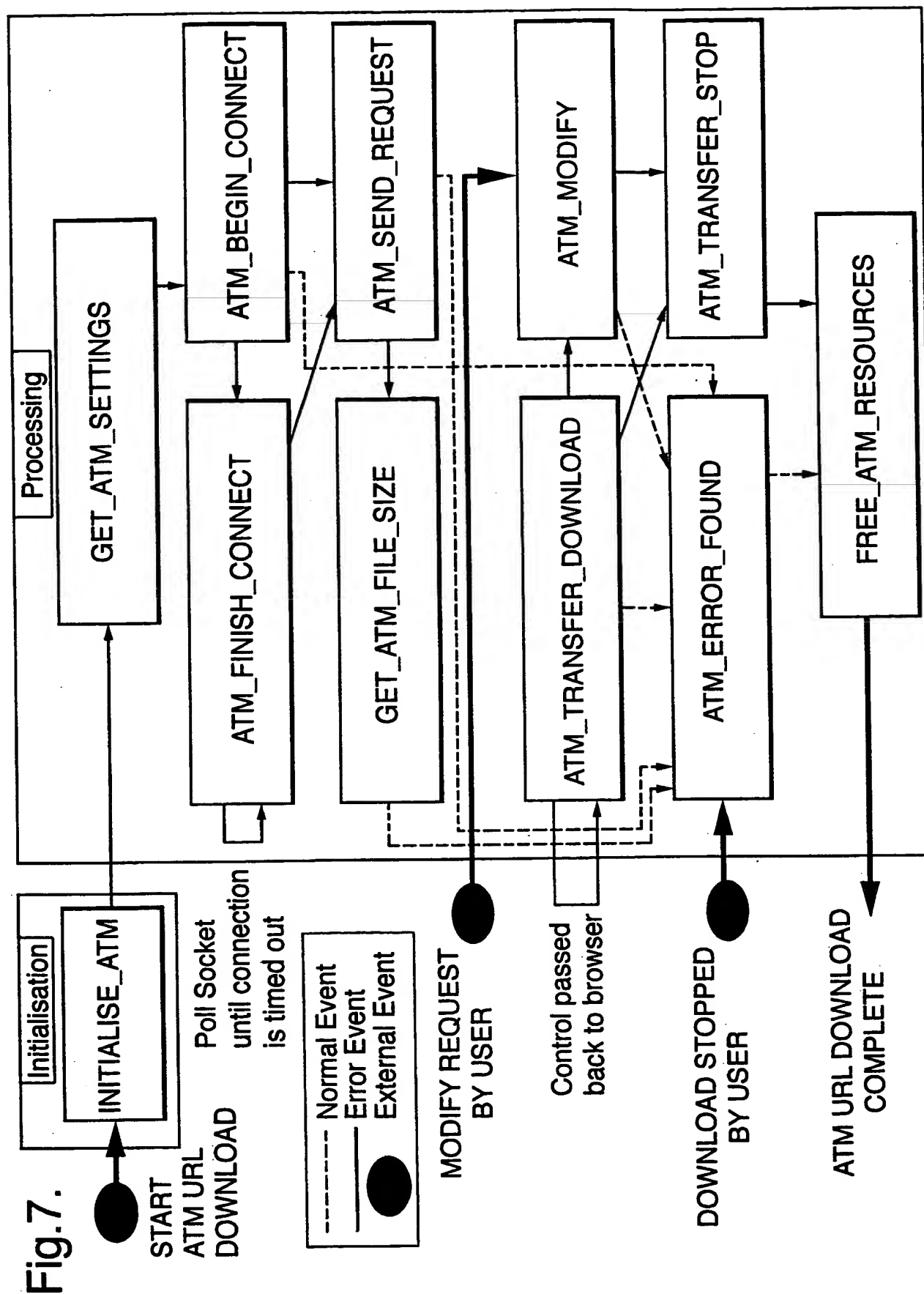
| European Patent Office | EUROPEAN SEARCH REPORT | Application Number EP 96 41 0106 |

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	COMPUTER COMMUNICATIONS REVIEW, vol. 25, no. 4, 1 October 1995, pages 49-58, XP000541650 PARULKAR G ET AL: "AITPM: A STRATEGY FOR INTEGRATING IP WITH ATM" * paragraph 2.1 *	1,10	H04L29/06 H04Q11/04
A	PROCEEDINGS OF THE ANNUAL SYMPOSIUM ON FOUNDATIONS OF COMPUTER SCIE, SANTA FE, NOV. 20 - 22, 1994, no. SYMP. 35, 20 November 1994, GOLDWASSER S (EDITOR), pages 424-434, XP000531950 LUND C ET AL: "IP OVER CONNECTION-ORIENTED NETWORKS AND DISTRIBUTIONAL PAGING" * paragraph 1 - paragraph 1.1 *	1,10	
A	DATA COMMUNICATIONS, vol. 24, no. 17, 1 December 1995, page 103/104, 106, 108, 110 XP000547618 MARSHALL G: "CLASSICAL IP OVER ARM:A STATUS REPORT" paragraph "Simple virtues""	1,10,11	TECHNICAL FIELDS SEARCHED (Int.Cl.6) H04L H04Q
A	IBM TECHNICAL DISCLOSURE BULLETIN, vol. 35, no. 4A, 1 September 1992, pages 28-31, XP000314666 "COORDINATED ADDRESS RESOLUTION PROTOCOL PROCESSING" * the whole document *	6,8,9	
A	EP 0 523 386 A (FUJITSU) * page 4, line 20 - page 5, line 14; figure 3 *	12	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	13 March 1997	Staessen, B